the storm center approached and caused a general warming-up of the air column, altho the temperature at the ground might not exceed 25°, yet in the cloud at the same time it would be 35°, giving precipitation in the form of rain.

While these inversions of temperature, as they are called, commonly occur at some height in the atmosphere, yet it is rare that an inversion of such magnitude persists so long as did the one last week. On the afternoon of the 15th the approaching cold wave was pushing in beneath the warm stratum, since the cold does not descend from the upper regions as was formerly supposed.

GREAT INVERSIONS OF TEMPERATURE.

By Prof. A. J. HENRY. Dated Mount Weather, Va., January 28, 1909.

Great inversions of temperature at Mount Weather are more frequently found in the rear than in front of cyclones and therefore are not attended by precipitation.

From the 1st to the 20th of the month of January, 1909, an inversion of temperature at one altitude or another was recorded on every day that a flight was made. On the 15th, the day mentioned by Professor Rotch in the note above printed, three inversions were recorded at Mount Weather, as follows:

At the ground (526 meters), 7.2°C.; at 690 meters, 9.8°C,; difference, +2.6° C. in 164 meters.

At 1,906 meters, 2.3°C.; at 2,109 meters, 5.7° C.; difference, +3.4°C. in 203 meters.

At 2,972 meters, 0.1°C.; at 3,031[1] meters, 0.8°C.; difference, +0.7°C. in 59 meters.

The first of these inversions was due to ground fog, the upper limit of which had risen to 1,145 meters with a temperature of 8.3°C., when the kite descended later in the day. The second inversion was due to the passage of the kites thru a cloud layer. The cause of the third inversion is not known.

Cases have arisen in which the forecaster, by reason of a knowledge of upper air temperatures, has been able to make a prediction of rain (or snow as the case may be), when the surface conditions pointed to the opposite conclusion.

A very striking inversion of temperature occurred on January 9, 1909, when all the conditions were favorable for precipitation; only a little, however, occurred. I quote the observations in full, humidity being lacking.

KITE OBSERVATIONS JANUARY 9, 1909.

	Temperature at the kite. °C.	°F.	Wind direction at the kite.
At the ground (526 meters)	—7.2	19.0	southeast.
At 750 meters	—6.3	20.7	south.
At 1,009 meters	—4.6	23.7	south-southwest.
At 1,250 meters	+1.4	34.5	south-southwest.
At 1,500 meters	6.9	44.4	south-southwest.
At 1,750 meters	9.0	48.2	south-southwest.
At 2,000 meters	7.6	45.7	south-southwest.
At 2,250 meters	5.5	41.9	south-southwest.
At 2,500 meters	3.4	38.1	south-southwest.
At 2,750 meters	1.3	34.3	southwest.

These figures show that the cold surface air extended about 500 meters above the surface and that there was a warm stratum of air moving from the south-southwest over it. The depth of this warm layer was approximately 1,750 meters (5,741 feet). Its under surface where it glided over the cold surface air was only a few degrees warmer than the next underlying stratum of air, but at its middle portion the temperature was 16.2° C. (29.2° F.), higher than at the surface of the ground. The sky was cloudy when the kites were launched, the lower level of clouds being about 900 meters above the station. At 9:15 a. m. a few snow flurries were observed as also at 12:30 p. m. after the kites had been landed.

Evidently the snow was the result of cooling by mixture along the rather indefinite boundary between the two layers of air. The upper warm current flowed in a direction parallel to the general trend of the Blue Ridge Mountains and consequently since the general level of the range changes but little, there was no opportunity for cooling by adiabatic expansion as would be the case in a current flowing at right angles to a mountain range. The air of the surface layer was saturated with moisture while that of the warmer air was doubtless considerably drier and hence it was possible for the surface fog and cloud to evaporate as actually happened later in the day.

The morning weather map gives a rather illuminating view of the weather conditions that prevailed at the time of the flight. An area of high pressure with its crest over New England, 30.50 inches, was passing to the eastward over the Atlantic. A dense layer of cloud overspread practically the whole country including the Atlantic coast, altho pressure in the last-named district exceeded 30.40 inches. At Asheville, N. C., light snow was falling with a southeast wind, thus showing that the conditions which existed at Mount Weather were common along the eastern slope of the Appalachians.

The kite flights at Mount Weather have repeatedly shown that the surface winds in areas of high pressure passing off to sea over the Atlantic coast are very shallow, and that at a few hundred meters above the mountain top warmer westerly winds prevail. On the border between the two wind systems there is always a rather thin cloud layer which under favorable conditions may increase in depth and produce rain.

But on the map in question the particular point to which I wish to draw attention is the rise of 20° F. in the surface temperature in Oklahoma, and also in the lower Lake region, while at Mount Weather a layer of warm air, relatively to the surface, prevailed at an altitude of about 500 meters above the station. It is the experience at Mount Weather that horizontally moving air currents having a temperature relatively higher than that of the surface descend rather slowly; thus a warm current, which first appears on the mountain top, has been known to require about twenty hours in the descent into the adjacent valleys, as shown at Trapp, 309 meters lower on the Loudoun side, and at Audley (near Berryville) on the Shenandoah side. It is assumed, therefore, that the surface warming shown on the weather map some distance from Mount Weather is evidence of the descent, during the previous twenty-four hours, of the layer of warm upper air which was observed at Mount Weather on the day in question. As a matter of fact the warm layer reached the surface at Mount Weather in about twenty-four hours after the kite observation.

[1] This was at the highest point attained by the kite in this ascent.

A PORTABLE ROTATION PSYCHROMETER.

By P. J. O'GARA, Assistant, Bureau of Plant Industry. Dated New Castle, Cal., January 16, 1909.

A form of psychrometer, designed to take the place of the ordinary sling psychrometer where it is impossible to use the latter, such as in thickets or heavily-wooded areas, or in caves where humidity readings are desired, is shown in fig. 1. The instrument consists of a large bevel gear, provided with a crank which drives a small gear. The axis, around which the small gear turns, carries a light steel frame which is revolved by the small gear and to which the wet- and dry-bulb thermometers are attached. This steel frame is so formed as to protect the thermometers, and being constructed of steel bands which are channeled it is sufficiently stiff to resist bending, making it almost impossible to break the thermometers. In the instrument shown in fig. 1 the ratio of the large gear to that of the small one is such that a linear velocity of 25 feet or more per second may be given to the thermometer bulbs, thus providing the means for rapid evaporation from the wet-bulb thermometer. This form of psychrometer is